APPENDIX J

GLOBAL POSITIONING SYSTEM

The ability to accurately determine position location has always been a major problem for soldiers. However, the global positioning system has solved that problem. Soldiers will now be able to determine their position accurately to within 10 meters.

J-1. DEFINITION

The GPS is a satellite-based, radio navigational system. It consists of a constellation with 21 active satellites and 3-spare satellites that interfaces with a ground-, air-, or sea-based receiver. Each satellite transmits data that enables the GPS receiver to provide precise position and time to the user. The GPS receivers come in several configurations, hand-held, vehicular-mounted, aircraft-mounted, and watercraft-mounted.

J-2. OPERATION

The GPS is based on satellite ranging. It figures the users position on earth by measuring the distance from a group of satellites in space to the users location. For accurate data, the receiver must track four or more satellites. Three satellites can be used if the user manually inputs the altitude for that location. Most GPS receivers will provide the user with the number of satellites that it is tracking, and whether or not the signals are good. Some receivers can he manually switched to track only three satellites if the user knows his altitude. This method provides the user with accurate data much faster than that provided by tracking four or more satellites. Each type receiver has a number of mode keys that have a variety of functions. To better understand how the GPS receiver operates, refer to the operators' manual.

J-3. CAPABILITIES

The GPS provides worldwide, 24-hour, all-weather, day or night coverage when the satellite constellation is complete. The GPS can locate the position of the user accurately to within 10 meters. It can determine the distance and direction from the user to a programmed location or the distance between two programmed locations called waypoints. It provides exact date and time for the time zone in which the user is located. The data supplied by the GPS is helpful in performing several techniques, procedures, and missions that require soldiers to know their exact location. Some examples are:

- Sighting.
- Surveying.
- Sensor or minefield emplacement.
- Forward observing.
- Close air support.
- Route planning and execution.
- Amphibious operations.
- Artillery and mortar emplacement.
- Fire support planning.

J-4. LIMITATIONS

Until the 21-satellite constellation is complete, coverage may be limited to specific hours of each day in certain areas of the world. The GPS navigational signals are similar to light rays, so anything that blocks light will reduce or block the effectiveness of the signals. The more unobstructed the view of the sly, the better the system performs.

J-5. COMPATABILITY

All GPS receivers have primarily the same function, but the input and control keys vary between the different receivers. The GPS can reference and format position coordinates in any of the following systems:

- **Degrees, Minutes, Seconds** (DMS): Latitude/longitude-based system with position expressed in degrees, minutes, and seconds.
- **Degrees, Minutes** (DM): Latitude/longitude-based system with position expressed in degrees and minutes.
- **Universal Traverse Mercator (UTM):** Grid zone system with thenorthing and easting position expressed in meters.
- **Military Grid Reference System** (MGRS): Grid zone/grid square system with coordinates of position expressed in meters.

The following is a list of land navigation subjects from other sections of this manual in which GPS can be used to assist soldiers in navigating and map reading:

a. **Grid Coordinates (Chapter 4)**. GPS makes determining a 4-, 6-, 8-, and 10-digit grid coordinate of a location easy. On most GPS receivers, the position mode will give the user a 10-digit grid coordinate to their present location.

b. Distance (Chapter 5) and Direction (Chapter 6). The mode for determining distance and direction depends on the GPS receiver being used. One thing the different types of receivers have in common is that to determine direction and distance, the user must enter at least one waypoint (WPT). When the receiver measures direction and distance from the present location or from waypoint to waypoint, the distance is measured in straight line only. Distance can be measured in miles, yards, feet, kilometers, meters, or nautical knots or feet. For determining direction, the user can select degrees, mils, or reds. Depending on the receiver, the user can select true north, magnetic north, or grid north.

c. **Navigational Equipment and Methods (Chapter 9)**. Unlike the compass, the GPS receiver when set on navigation mode (NAV) will guide the user to a selected waypoint by actually telling the user how far left or right the user has drifted from the desired azimuth. With this option, the user can take the most expeditious route possible, moving around an obstacle or area with out replotting and reorienting.

d. **Mounted Land Navigation (Chapter 12**). While in the NAV mode, the user can navigate to a waypoint using steering and distance, and the receiver will tell the user how far he has yet to travel, and at the current speed, how long it will take to get to the waypoint.

e. **Navigation in Different Types of Terrain (Chapter 13).** The GPS is capable of being used in any terrain, especially more open terrain like the desert.

f. **Unit Sustainment (Chapter 14).** The GPS can be used to read coordinates to quickly and accurately establish and verify land navigation courses.